

Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

AGRICULTURAL NOTES

SEP 14 1925
PUBLISHED BY

PORTO RICO AGRICULTURAL EXPERIMENT STATION, MAYAGUEZ
OFFICE OF FARM MANAGEMENT, FEDERAL BUILDING, SAN JUAN

No. 14 Page 1.

San Juan, Porto Rico, April 1925.

SOME PINEAPPLE PROBLEMS.

6th ARTICLE. - DETERMINATION OF A SOIL'S SUITABILITY FOR PINEAPPLE GROWING.

By Henry C. Henricksen.

The first question asked in the first article of this series was "why is a certain soil unsuitable for pineapple growing while that a few feet away produces fine crops?" That question is of great importance in solving soil problems, for where a number of plants in one spot are very different in outward appearance from the majority of the plants in the field the difference is unquestionably due to soil conditions. The differences, that have, so far, been found and for which direct measurements have been described in the previous articles, are aeration, reaction and the state of the colloidal matter of the soil. There may be other differences, for which other methods will have to be devised, but the above mentioned seem to be the only ones of immediate importance for when the conditions, found by such measurement to be wrong, are corrected the plants thrive normally. The measurements are not infallible; they could not be expected to be considering the complicated nature of the problems, but after learning how to draw conclusions from the results obtained with soils in which plants are growing, it is possible to judge the suitability of a soil before it is planted.

THE LOW SPOTS. - This class of unsuitable soil has been studied to good advantage on the flat marshy land near the railroad between Bayamón and Toa Baja. Some of that land was in a virgin condition twenty years ago and from the appearance of it then it is possible to explain the spotty condition of it today. That land was at one time a tidal flat upon which the water advanced and receded periodically. In course of time the water subsided and instead of inundating the whole area it merely covered the low spots. In time these became connected with one another by means of shallow channels in which the water flowed, thereby preventing silt deposits and growth of vegetation. On the higher areas silt was deposited periodically and vegetation flourished, as a result of which agricultural soil was formed. When the water subsided entirely the shallow channels remained to carry off the rain water and although some vegetation grew in them agricultural soil was not formed before the land was brought under cultivation. Today the channels, as such, have disappeared because of cultivation, although the outlines are still visible. However, most people would pay but scant attention to those outlines if the land were used for such crops as sugar cane for the effect would scarcely be noticeable. But with pineapples it is very different. When the soil is, for some reason, unsuitable the plants show it. Soil conditions that were not suspected become visible through the growth of the pineapple plant.

The soil in the low spots differ from that of the surrounding areas in several respects. It is usually lighter in color, which is due to less clay and humus. The latter difference was undoubtedly much greater when the land was first brought under cultivation but today it is but very slight. The greatest difference is in the size of the soil particles. In the low spots the soil is of finer texture and packs closer than that of the surrounding areas. That, together with poor drainage, brings out prominently the problem of aeration. Drainage may be provided for but it does not entirely solve the problem. Additional aeration is needed, as demonstrated by making heavy applications of muck or cover crops. That has an almost instantaneous effect not alone because it improves aeration but also because it changes the soil reaction and the state of the colloidal matter. The colloidal matter itself is perhaps of no importance, for there is very little present but by the behavior of it the changes are indicated. The ultimate test is, of course, the behavior of the plants and by observing that the former conclusions have been confirmed in repeated tests. Drainage and organic matter should be supplied, however, before the plants are set, for plants that become stunted in growth cannot always be brought back to normal condition.

The low spots are traceable everywhere on the coastal plain as well as in the valleys between Vega Baja and Arecibo, although in the latter the formation is older and the water channels are practically obliterated. The conditions there are the same as those described above but usually more aggravated because the soil is clay and therefore more difficult to aerate. The low spots are more alkaline than the surrounding areas due to the smaller amount of organic matter originally present and perhaps also to a larger deposit of lime in the soil. The remedy is drainage, large applications of organic matter or anything else that will improve aeration. If the pH is 6 or above and if the colloidal matter does not settle readily sulfur should be applied.

THE HIGH SPOTS. - These are also traceable everywhere, but they are usually more frequent on hilly land than on the flats. The condition is due to the absence of surface soil, the subsoil coming to the surface. The difference in suitability between good surface soil and subsoil is entirely due to aeration. The subsoil is not poisonous to pineapple roots, but it packs too closely to allow as much air circulation as the plants require. The remedy is organic matter, but so much of it is required that it is not usually possible to build up such soils in a few years.

THE PUDDLED SPOTS. - These occur on all soils. They are frequent at the ends of plant beds, the puddling being caused by work animals and implements when the soil is worked in wet condition. Often a streak can be traced through a field which on closer investigation is found to be due to an old road. Also large spots are frequently found that are due to puddling caused by human habitations. Shacks are, and have been, built promiscuously and after they disappear there is nothing left to show they were there except perhaps some potsherds. But the puddled condition of the soil remains for a long time and when pineapples are planted the spots become clearly visible. The remedy is deep plowing, thorough pulverizing and an abundance of organic matter. Also, if the pH is around 6 and if the water does not clear in a few hours/after the soil has been mixed with it, an application of sulfur at the rate of 500 to 1,000 pounds per acre, will be beneficial.

THE LIMY SPOTS. - These spots and the conditions causing them have been thoroughly investigated by other members of the staff of this Station and the results were published in bulletin No.11 (1911). They occur frequently on land adjoining the public roads where limestone has been dumped or where water has washed lime carbonate from the road onto the field. The spots are frequent on sandy soil near the coast; in fact there the spotty condition is usually reversed, the majority of the plants being abnormal and only a few, in spots, being green and healthy. The condition can be remedied with sulfur and it is practicable to use that if there is not too much lime present. The limit for that has not been finally determined but it appears, from the results obtained, that it is not practicable to remedy the condition in coral sand containing 20% to 30% calcium carbonate. On the other hand it will pay to apply sulfur on soils containing considerable large pieces of limestone. Such limestone may remain in the soil without causing much damage to the pineapple plant, at least for some time, after the soil itself has been acidified with sulfur.

If a grower is in doubt about the sand or pieces of rock in his soil being limestone he can readily determine it by the acid test. If the soil is sandy spread a pinch of it on a plate and pour onto it some muriatic acid. The grains from which effervescence takes place are limestone whereas those that are not affected are not. If the soil is clayey wash most of the clay off and then make the test on the remaining sand. If most of it effervesces the soil is very unsuitable for pineapple growing and no remedy that is practicable has so far been found.

There are unsuitable soils which can not exactly be classed under any of the four topics described, but the degree of unsuitability can always be measured by the methods given in the former articles. It is not necessary, however, to always use the apparatus, described in the 3rd article, for measuring aeration. After having used that for some time on suitable and unsuitable soils it is possible to make estimations without it. But it should be remembered that the apparatus cannot be used except on cultivated soil, and likewise an estimate of how the soil will behave after cultivation cannot well be made, before it is at least plowed. The pH and the state of the colloidal matter can, on the other hand, be determined on pasture or forest land as well as on that which is cultivated.

